PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
032052wo/Me/bs		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 03/09907	01.04.2003	02.04.2002
International Patent Classification (IPC) or both national classification and IPC		
H01L23/373		
Applicant		
3M INNOVATIVE PROPERTIES COMPANY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
10.09.2003	16.06.2004
Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Corchia, A Telephone No. +49 89 2399-7165

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US 03/09907

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-18 as originally filed

Claims, Numbers

1-5 filed with telefax on 20.04.2004

Drawings, Sheets

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-5
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-5
Industrial applicability (IA)	Yes:	Claims	1-5
	No:	Claims	

2. Citations and explanations

   see separate sheet

The examination is being carried out on the **following application documents:**

Text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LT LU LV MC MK NL PL PT RO SE SI SK TR

Description, pages:

1-18 as originally filed

Claims, No.:

1-5 with telefax of 20/04/2004

Drawings, sheets:

1/4-4/4 as originally filed

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

   D1: US 2001/036065 A1 (YAMASHITA YOSHIHISA ET AL) 1 November 2001 (2001-11-01)
   D2: EP-A-1 088 870 (3M INNOVATIVE PROPERTIES CO) 4 April 2001 (2001-04-04)

2. The subject-matter of claim **1** is considered not inventive (Article 33(3) PCT).

   The document D1 is regarded as being the closest prior art to the subject- matter of claim 1, and discloses (the references in parentheses applying to Fig.12 in this document):

   A thermosetting adhesive sheet (12) with electroconductive and thermoconductive properties, comprising: a thermosetting adhesive sheet (12) having two major

surfaces, composed of a thermosetting adhesive composition, and having at least one through-opening region (14) formed at a prescribed location;

The subject-matter of claim 1 therefore differs from this known adhesive sheet in that (a) the thermosetting composition specifically comprises an ethylene-glycidyl (meth)acrylate copolymer and a rosin, said rosin containing a carboxyl group, and (b) the through-opening is filled with low melting point solder.

Feature (a) in claim 1 merely consists in the selection of a particular composition for the thermosetting adhesive.
With regard to this, D1 teaches that epoxy resin is one of the preferred main components of the thermosetting adhesive composition (cf. par.80 in D1).
Document D2 discloses (cf. par.14-22 in D2) an epoxy resin with the same composition of claim 1, which has "advantageous properties for bonding electronic parts" (cf. abstract of D2). The skilled person has therefore a clear incentive to employ the thermosetting adhesive composition of D2 for the adhesive sheet of D1, thus arriving at feature (a) in claim 1.

Concerning feature (b), it is worth considering that, as in the present application, the through-opening (14) in the adhesive sheet of D1 provides an electrical connection, namely a ground pattern, to the heat sink (cf. par.30 in D1). This electrical connection is realised by means of a metal pole, which is preferably made of the same material of the heat sink and coated, e.g. with solder (cf. par.83,85 in D1). Consequently, the through-opening of the adhesive sheet of D1 also inherently provides thermal conductivity, as in claim 1 of the present application.
Therefore, the low melting point solder (as in claim 1) seems to be merely a substitution of the solder-coated metal of D1 with an equivalent technical feature, which the skilled person would do without the exercise of inventive skill.
The subject-matter of claim 1 is therefore considered not inventive according to Article 33(3) PCT.

3. Dependent claims **2-5** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and inventive step, the reasons being as follows.

3.1 D2 discloses (cf. par.39) a thermosetting adhesive composition comprising an ethylene-alkyl (meth)acrylate copolymer, as in claim **2**.

3.2 D1 discloses a thermosetting adhesive sheet further comprising a release sheet on at least one surface thereof (cf. par.115), as in claim **3**.

3.3 D1 discloses an electronic structure (cf. Fig.12 and par.104) comprising a thermosetting adhesive sheet according to claim 1, wherein said thermosetting adhesive sheet (12) is a heat-radiating adhesive sheet which is positioned between an electronic element (23) and heat radiating means (13) and adheres said electronic element (23) to said heat radiating means (13), as in claim **4**.

3.4 D1 discloses an electronic structure (cf. Fig.12), wherein said prescribed location of said through-opening region (14) touches said electronic element (23), as in claim **5**.

4. Further remarks regarding form and content of claims and description:

4.1 The subject-matter of claim 1 is not clear (Article 6 PCT). The feature of crosslinking formed by electron beam radiation refers to a method of manufacturing the adhesive sheet of claim 1 rather than clearly defining the latter in terms of its technical features. The intended limitations are therefore not clear from this claim, contrary to the requirements of Article 6 PCT.

4.2 The TAB layer of Fig.2 is indicated by the reference sign **7** in the description (cf. p12 lines 1-9), but is wrongly labelled with reference sign **1** in fig.2. Therefore, the application does not meet the requirements of Rule 10.2 PCT, according to which the terminology and the signs shall be consistent throughout the application.

4.3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

CLAIMS

What is Claimed is:

1. A thermosetting adhesive sheet with electroconductive and thermoconductive properties, comprising:

a) a thermosetting adhesive sheet having two major surfaces, composed of a thermosetting adhesive composition comprising an ethylene-glycidyl (meth)acrylate copolymer and a rosin, said rosin containing a carboxyl group, where crosslinking is formed between the ethylene of said copolymer by electron beam radiation, and having at least one through-opening region formed at a prescribed location, and

b) low melting point solder placed within said at least one through-opening region formed at the prescribed location.

2. A thermosetting adhesive sheet according to claim 1, wherein said thermosetting adhesive composition further comprises an ethylene-alkyl (meth)acrylate copolymer.

3. A thermosetting adhesive sheet according to claim 1, wherein said thermosetting adhesive sheet further comprises a release sheet on at least one surface thereof.

4. An electronic structure comprising a thermosetting adhesive sheet according to claim 1, wherein said thermosetting adhesive sheet is a heat-radiating adhesive sheet which is positioned between an electronic element and a heat radiating means and adheres said electronic element to said heat radiating means.

5. An electronic structure according to claim 4, wherein said prescribed location of said through-opening region touches said electronic element.